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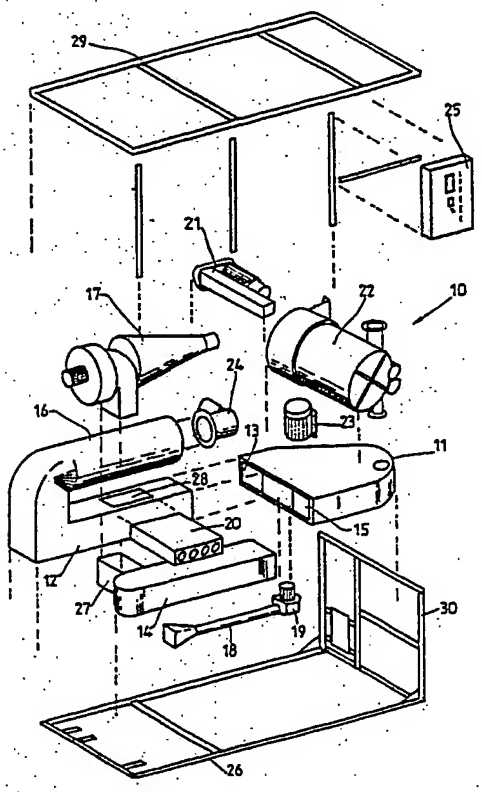
(57) Abstract

A processing plant (10) includes an agitator (11), an inlet duct (12) adapted to be coupled to an inlet (13) of the agitator (11), and a drying duct (14) adapted to be connected to an outlet (15) of the agitator (11). The inlet duct (12) is connected to a burner chamber (16) and the drying duct (14) can be connected to a cyclonic separator (17). The flow dryer includes a return duct (18) which co-operates with a classifier located adjacent the downstream end of the drying duct in order to return unclassified material to the agitator for reprocessing via rotary airlock (19). The plant includes a pretreatment facility which is preferably a preheater (20) and a tallow extraction press (21), and a post-treatment facility which is preferably a rotary screen (22), the major components of the processing plant are configured to fit within the periphery of an imaginary box which is a size of a standard 20 ft shipping container. The processing plant is built up of a number of layers and the configuration of the pretreatment and post-treatment elements of the plant enable a complete processing plant to be manufactured and transported as a "containerised" plant.



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TRANSPORTABLE FLOW DRYING PLANT

TECHNICAL FIELD

THIS INVENTION relates to a processing plant employing a flow dryer to dehydrate organic matter and in particular to a processing plant which operates on a continuous basis and performs pretreatment of the matter prior to the matter entering the flow dryer.

BACKGROUND ART

The applicant's U.S. Patent No. 4,573,278 describes a flow dryer which can be employed as part of a processing plant for a range of organic materials. While the flow dryer as described is suitable for processing grains and cereals such as rice or soya bean or other plant matter, where high fat content material is to be processed, pretreatment to remove tallow is required.

This earlier dryer is built within an imaginary box having external dimensions slightly smaller than a standard twenty foot shipping container. The major component of a processing plant is the flow dryer. The major components of the flow dryer are the agitator, the burner chamber, the inlet duct connecting the burner chamber to the agitator, the drying duct and the cyclonic separator which are all contained within the imaginary box. Thus, the major component of the processing plant can be assembled at the factory and minimum on-site installation is required. The only on-site installation required is to add peripheral elements such as preheaters, tallow extruders, presses, infeed augers, output sieves, output screens, hoppers and other peripheries which may be required for a particular application.

The requirement for the addition of peripheries on-site detracts from the advantages which follow from having a "containerised" plant. In particular, as the flow dryer has the capacity for adjustment to treat different materials, it would therefore be desirable to include a pretreatment facility for removal of tallow from high fat content material prior to the material being fed into the

flow dryer. This type of pretreatment facility is the most common periphery which is added externally to the frame on-site. Of course post treatment of material is also involved and again spacial limitations within the imaginary box has had a deleterious effect on the post treatment provided. In particular, the prior post treatment involves screening the dried product in a rotary screen whereby some of the larger partially comminuted and dried particles are separated from the smaller particles and recycled. The smaller particles are collected in a hopper adjacent the screen. Due to spacial limitations created by the hopper employed and its associated outfeed auger, the screen size was limited to less than optimum and accordingly, the throughput of matter processed by the whole plant was limited by the rate at which product could be screened.

The boundary conditions which limit the relative sizes of the flow dryer components, the preheater, the tallow extractor and screen include basic economic considerations of whether the plant is cost effective to operate, and limitations on the overall efficiency and which is derived from the required physical and chemical limitations arising from the nature of material being processed. For example, in order adequately preheat matter to a sufficient temperature prior to extraction of tallow, reduction in size of the preheater must be compromised by an increase in the heat delivered to the preheater and hence the burner chamber capacity must be increased. Similarly, increases in the screen capacity to match the flow dryer through-put must necessarily compromise the other components of the plant. This is of course unless the existing space can be utilised in a most efficient manner by providing new and novel construction techniques and peripheries.

In the applicant's Australian Patent Application No. 48283/85, a preheater/tallow extruder assembly was positioned inside the inlet duct. The high fat content matter could be preheated and the tallow extruded from same prior to the matter leaving the preheater/tallow extruder

assembly and being carried to the agitator for drying and comminution. While this arrangement enabled the preheater/tallow extruder to be located within the box-like frame, the arrangement had a number of deficiencies. As the assembly was located within the inlet duct, it was subject to the full intensity of the hot gas stream and therefore the heating of the high fat content matter within the preheater/tallow extruder assembly could not be readily controlled. In addition, as the preheater/tallow extruder assembly was inside the inlet duct, it was difficult to service.

DISCLOSURE OF THE INVENTION

It is an object of the present invention to alleviate at least to some degree the aforementioned problems of the prior art.

In one aspect therefore, the present invention resides in a processing plant contained within the periphery of an imaginary box the size of a shipping container, the plant comprising a flow dryer and a pretreatment facility for pretreatment of matter before delivery of pretreated matter to the flow dryer, the flow dryer including an inlet duct, an agitator and a drying duct connected in series, the drying duct and inlet duct being generally upright ducts disposed in side-by-side fashion with the agitator bridging between respective lower end portions of the inlet duct and the drying duct, a burner chamber behind and in flow communication with an upper end portion of the inlet duct, a cyclonic separator behind and in flow communication with an upper end portion of the drying duct, the pretreatment facility comprising a preheater located adjacent and externally of the inlet duct, the preheater having an inlet for flow of gas into the preheater from the inlet duct and an outlet for flow of gas from the preheater back into the inlet duct.

Th preheater preferably includes an array of spaced series connected pipes along which organic matter to be preheated can travel prior to the pretreated matter being

delivered to the agitator, each pipe having a screw conveyor to convey the organic matter so the matter travels through the preheater along a generally serpentine path, the preheater having an outer housing spaced from the pipes so hot gas introduced to the preheater can circulate about the pipes in heat transfer relation. Thus, in this embodiment, by arranging the preheater as an array of pipes, it can be located within a box-like frame which can be located within the shipping container, the preheater being located externally of the inlet duct and as a consequence of its adjacency to the inlet duct part of the gas stream can be diverted from the inlet duct and into the preheater. It is preferable to control the amount of gas delivered to the preheater and to this end the flow dryer includes a closure member operable to selectively divert all or a portion of the hot gas flowing along the inlet duct to the preheater.

The pipes are preferably parallel spaced pipes including an inlet pipe, an outlet pipe and at least one intermediate pipe between the inlet and outlet pipes. The pipes are preferably made from a high thermal conductivity metal and include heat transfer vanes protruding into the gas stream.

The inlet and outlet are preferably defined by openings in the preheater housing on opposite sides of an inlet duct partition in the inlet duct, the inlet being located on one side of the partition as an opening into the preheater housing and the outlet being defined as an opening out of the preheater housing on the other side of the partition.

The closure member is preferably operable to divert all hot gas to the preheater, or a portion of the hot gas to the preheater or operable to have the gas stream by-pass the preheater altogether. Thus, with this arrangement, the preheater can be by-passed so low fat content matter can be dried without preheating. Alternatively, if a desired preheating is required, a portion of the hot gas stream can

be diverted by adjusting the closure member until the desired temperature is achieved. In one preferred embodiment, the closure member comprises a movable flap or plate located adjacent an upstream end of the inlet duct partition to selectively intercept the stream of hot gas and thereby divert selected proportions of the hot gas stream either side of the partition. In this embodiment, the downstream end of the partition on the preheater inlet side is closed off so that all hot gas diverted to the inlet side by the closure member passes into the preheater, and thereafter travels from one end of the preheater to the opposed end of the preheater and back along a return path to the preheater outlet where the stream is introduced back into the inlet duct. In another embodiment, it is advantageous to provide a second flap or plate which can be employed adjacent the downstream end of the inlet duct partition if it is desirable to permit gas to by-pass the preheater on both sides of the partition. Thus, for a vertical inlet duct, the partition is preferably a vertical plate extending partially along the inlet duct adjacent the preheater inlet and the preheater outlet, the partition having respective pivotal plates coupled to respective upstream and downstream ends of the partition, the respective plates being pivotable to engage respective opposed walls of the inlet duct to allow or prevent passage of hot gas along the inlet duct on respective opposite sides of the partition.

In another aspect, the invention resides in a method for construction of a processing plant so the plant is contained within the periphery of an imaginary box having the dimensions of a shipping container, the method including the steps of:-

(a) forming a first layer of construction, the first layer including a first side frame member;

(b) forming a second layer of construction upon the first layer, the second layer of construction comprising, an agitator, an inlet duct connected to an inlet of the

agitator and a drying duct connected to an outlet of the agitator with the agitator bridging between the inlet duct and the drying duct;

(c) forming a third layer of construction upon the second layer of construction subsequent to or prior to forming part of a fourth layer of construction, the third layer of construction including a preheater mounted in gas flow relationship with the inlet duct and a press adapted to receive preheated matter from the preheater, the preheater comprising an array of spaced series connected pipes along which organic matter to be preheated can travel, each pipe having a screw conveyor to convey the organic matter so that matter travels through the preheater along a generally serpentine path, an outer casing spaced from the pipes so hot gas introduced to the preheater can circulate about the pipes in heat transfer relation;

(d) forming a fourth layer of construction prior to or subsequent to forming the third layer of construction, the fourth layer of construction being spaced from the second layer of construction, the fourth layer of construction including a burner chamber adjacent to and in communication with the inlet duct and a cyclone adjacent to and in communication with the drying duct, and a screen assembly adapted to receive product from the cyclone;

(e) forming a fifth layer of construction on the fourth layer of construction, the fifth layer of construction including a second side frame member opposed to the first side frame member.

The press preferably includes an elongate housing, a cylindrical screen within the housing, the cylindrical screen having inlet and outlet ends with an outlet adjacent the outlet end, a screw conveyor inside the cylindrical screen to convey matter from the inlet end to the outlet end and force the matter through the outlet, a choke adjacent the outlet of the cylindrical screen, the choke comprising a biased closure member, the closure member being biased toward the outlet to inhibit passage of matter

through the outlet and thereby press the matter so tallow is extracted through the screen. Preferably, the housing includes a drain whereby tallow can be removed from the housing. Advantageously, the screw conveyor is driven by a drive motor located beneath the housing so that the press and the motor form a compact structure.

The cylindrical screen is preferably removably mounted within the housing so that the screen can be easily removed from the housing in order to change screens for different mesh sizes. Advantageously, a 1.5mm mesh is used for fish products which can be interchanged with a 3mm screen which is preferred for other meat products. Where a 1.5mm mesh screen is employed or other screens which are not self supporting, it is preferable to provide an apertured reinforcing plate on which the screen is supported.

The closure member is preferably a circular plate spaced from the outlet and being biased toward the outlet by a suitable biasing means such as a hydraulic or pneumatic cylinder assembly.

The screen assembly is preferably a rotary screen assembly which comprises a rotary screen having an endless mesh wall through which particulate matter can be screened as the screen rotates about a longitudinally extending axis, and a housing having an endless imperforate wall surrounding the screen to receive particulate material that has passed through the screen, the housing being rotatable about a longitudinally extending axis, in use the mesh wall of the screen and the imperforate wall of the housing being set at an oblique to the horizontal so that as the screen and the housing rotate about their respective longitudinal axes particulate material can travel along the respective walls to a lower end of the screen assembly.

The rotary screen can be of any convenient transverse cross-section but a generally cylindrical screen is preferred. The rotary screen preferably includes a lower edge comprising a plurality of longitudinally extending and circumferentially spaced fingers protruding from the

housing and secured to the mesh wall so that larger particles that have failed to pass through the mesh wall can pass between the fingers and be returned to the flow dryer for reprocessing while lighter filamentary material such as wool or cotton can ball on the fingers as the screen rotates and finally exit the screen for collection.

The housing can be of any convenient transverse cross-section but is preferably cylindrical and is preferably mounted concentrically with the screen. The housing can rotate independently of the screen but preferably, the screen and the housing rotate in concert.

The screen assembly preferably includes two chutes, an outlet chute adjacent the lower edge of the housing communicating with an outlet conveyor which is adapted to deliver the finished product from the plant for collection, and a recycling chute communicating with a recycling conveyor which is adapted to return the larger partially dried and comminuted particles to the flow dryer for reprocessing.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention can be more readily understood and be put into practical effect, reference will now be made to the accompanying drawings wherein:

Figure 1 is an exploded pictorial view illustrating a processing plant constructed according to the present invention;

Figure 2 is a perspective view from above of a preferred plant;

Figure 3 is a perspective view illustrating the plant of Figure 2 from below;

Figure 4 is a pictorial view illustrating a preferred preheater applicable to a plant according to the present invention;

Figures 5 and 6 are pictorial views illustrating a preferred press applicable to a processing plant according to the present invention; and

Figure 7 is a pictorial view illustrating a preferred

rotary screen applicable to a plant constructed according to the present invention.

BEST MODE OF CARRYING OUT THE INVENTION

Referring to the drawings and initially to Figure 1, there is depicted in exploded perspective view a processing plant according to the present invention.

Figure 1 illustrates the major components of the processing plant and their relationship during the steps by which the processing plant is constructed to form a plant which is contained within the periphery of an imaginary box having the dimensions of, in this case a twenty foot shipping container.

The plant 10 includes an agitator 11, an inlet duct 12 adapted to be coupled to an inlet 13 of the agitator 11, and a drying duct 14 adapted to be connected to an outlet 15 of the agitator 11. The inlet duct is connected to a burner chamber 16 and the drying duct can be connected to a cyclonic separator 17. The other components of the flow dryer include a return duct 18 which co-operates with a classifier located adjacent the downstream end of the drying duct in order to return unclassified material to the agitator for reprocessing via rotary air lock 19.

The plant includes a pretreatment facility which in this embodiment includes a preheater 20 and a tallow extraction press 21, and a post treatment facility which in this embodiment includes a rotary screen 22. The other incidental elements illustrated in Figure 1 which are also enclosed within the imaginary box include the agitator drive motor 23, the burner chamber blower 24 and the main control console 25. There are of course other minor components but the major components only have been illustrated for clarity. The plant is assembled in layer fashion, the method including the steps of:-

(a) forming a first layer of construction, the first layer including a first side frame member 26;

(b) forming a second layer of construction upon the side frame member 26, the second layer of construction

comprising the agitator 11, the inlet duct 12 connected to the inlet 13 of the agitator, and the drying duct 14 connected to the outlet 15 of the agitator so that the agitator bridges between the inlet duct and the drying duct to form a generally U-shaped structure upon the first frame member 26. At this stage, the return duct 18 can be located in position as can the cyclone connecting duct 27 but as these components are of relatively small size they can, if need be, be built into the plant after all the major components have been assembled;

(c) forming a third layer of construction upon the second layer of construction subsequent to or prior to forming part of a fourth layer of construction, the third layer of construction including the preheater 20 mounted in gas flow relationship with the inlet duct via an opening 28 in the inlet duct, optionally forming part of the fourth layer, the part being the burner chamber which can be mounted in place before the preheater is secured to the inlet duct between the inlet duct and the burner chamber. Likewise, the press 21 can be mounted in position below the preheater and adjacent the inlet duct before or after the burner chamber is in position;

(d) prior to or subsequent to forming the third layer of construction, forming a fourth layer of construction spaced from the second layer of construction, the fourth layer of construction including the burner chamber 16 adjacent to and in communication with the inlet duct 12, the cyclonic separator 17 adjacent to and in communication with the drying duct 14 and a rotary screen assembly 12 adapted to receive product from the cyclone;

(e) forming a fifth layer of construction on the fourth layer of construction, the fifth layer of construction including a second side frame member 29 opposed to the first side frame member 26 to form a box-like frame. In the embodiment illustrated, the agitator and screen assembly are secured to a base frame member 30 whereas the inlet duct 12 and the drying duct 14 are secured to the

side frame member 26 via expansion joints which will be described more clearly below in relation to Figure 2.

Referring to Figures 2 and 3, depicting the fully assembled processing plant as can be seen, the whole plant is contained within a box-like frame 31. Like numerals have been used to illustrate like features.

In particular, it can be seen from Figures 2 and 3 that the preheater 20 extends the full width of the plant in the third layer between the second layer, comprising the agitator, inlet duct and drying duct and the fourth layer comprising the burner chamber, the cyclone and the rotary screen. Thus, the arrangement illustrated where the preheater includes an array of series connected pipes serves to efficiently utilise the limited amount of space within the imaginary box whereby the preheater can be located closely to the inlet duct so that the intense stream of hot gas flowing from the burner chamber 16 along the inlet duct can be diverted into the preheater for pretreatment of matter.

As can also be seen, the rotary screen is of maximum capacity for the available space in the fourth layer of the assembled plant and omits the need for a hopper by providing a rotating housing (see Figure 7).

The frame member 26 includes sub-frame members 26' which form expansion mounts for the drying duct and the inlet duct. The drying duct and the inlet duct include co-operating rails which slide in the expansion mounts as the ducts expand when the plant is operational.

Referring to Figure 4, the preheater is illustrated in more detail. As can be seen, Figure 4 is a cut-away pictorial view illustrating the preheater 20 and the interior of the inlet duct 12. The preheater 20 includes an inlet 32 whereby hot gas can be delivered from the inlet duct 12 into the preheater 20, and an outlet 33 whereby hot gas leaving the pr heater can be returned to the inlet duct 11 after circulation through the preheater 20. In the illustrated embodiment, a partition 34 extends partially

along the inlet duct 12 and the preheater inlet 32 is located on one side of the partition 34 and the preheater outlet 33 is located on the other side of the partition 34. A closure member in the form of a pivoting plate 35 is coupled adjacent the upstream end of the partition 34 and can be moved to selected locations within the inlet duct 12 so that all the stream of hot gas can be diverted to the preheater inlet side of the partition whereas at the other extreme, all the stream of hot gas can be diverted to by-pass the preheater. A second pivoting plate 36 coupled to the partition 34 adjacent its downstream end is pivotal between the position shown in solid outline, that is in abutment with an internal wall of the inlet duct so as to prevent passage of hot gas beyond the partition on the preheater inlet side of the partition, and thereby divert all hot gas through the preheater.

Thus, by the operation of plate 35 selected proportions of the hot gas stream can be diverted to the preheater in order to raise the temperature of material in the preheater to a predetermined temperature prior to that material being transferred to the press for extraction of tallow.

In the illustrated embodiment, the preheater includes an array of spaced pipes operating in series including an inlet pipe 37, an outlet pipe 38 and two intermediate pipes 39 and 40. The pipes are located within a preheater housing 41 which is spaced from the pipes to allow the heated gas diverted to the preheater to circulate about the pipes. Five wall portions 42 bridge between the pipes in order to divide the interior of the preheater into a forward passage 43 and a return passage 44. Thus, the heated gas stream is in heat transfer relationship with the pipes over the full length of either side of the pipes as the heated gas flows between the preheater inlet and the preheater outlet. Each pipe includes an auger (not shown) for carrying organic matter to be preheated along the pipes. The matter enters the inlet pipe 37 via an inlet

chute 45 after which it travels along the inlet pipe, which has its outlet connected via a chute (not shown) to the intermediate pipe 39 whereafter the matter travels back along the intermediate pipe 39 to chute 46 where it is delivered to intermediate pipe 40, and the matter travels again in the reverse direction to a further chute, whereafter the matter travels in the reverse direction along the outlet pipe 38 to exit from the preheater via a further chute where the heated matter can free fall into the press.

It will be appreciated that the wall portions 42 only extend as far as the preheater inlet and that the gas flowing to the preheater outlet flows from the return path back between the pipes 37, 38, 39 and 40. In order to enhance heat transfer between the hot gas and the pipes, each pipe includes a plurality of heat transfer vanes 47 secured along their length.

Referring to Figures 5 and 6, there is illustrated details of a preferred press 21, the press 21 is mounted on a frame 48 above a motor 49 to form a compact structure. The press 21 includes an elongate housing 18 in which a cylindrical screen 50 is mounted longitudinally, a screw conveyor 51 is mounted inside the cylindrical screen 50 so as to convey material toward an outlet 52. A closure member in the form of a circular plate 53 is biased toward the opening 52 in order to inhibit the passage of matter through the opening 52. In the illustrated embodiment, the circular plate 53 is biased toward the opening by a hydraulic cylinder assembly 54 which is coupled indirectly to the plate 53 via a linkage 55 so the plate 53 can move between the positions illustrated in solid and broken outline as matter is forced through the outlet 52. The cylindrical screen illustrated in Figure 6 is a 1.5mm mesh screen 56, which is not in itself self supporting and as so, the screen is reinforced by a thicker apertured reinforcing plate 57, and it will be appreciated that the screen and the reinforcing plate extend the full length of

the screw conveyor 20 between inlet and outlet ends of the press.

The press includes a drain 58 at a lower end thereof so that tallow extracted through the screen can flow to the drain to exit from the housing for later collection.

Referring to Figure 7, there is illustrated a preferred screen assembly applicable to a processing plant according to the present invention. The rotary screen assembly 22 in this embodiment includes a generally cylindrical screen 59 mounted co-axially with a housing which in this embodiment is an imperforate cylindrical wall 60, the screen 59 includes a lower edge 61 which protrudes beyond the lower edge 62 of the cylindrical housing 60. Particulate matter which passes through the screen can exit the screen assembly before larger particles. The larger particles remain inside the screen and travel beyond the edge 62 and can therefore be collected separately and returned to the flow dryer. Portions of the screen assembly have been cut away to illustrate the internal structure of the screen assembly. As can be seen, the screen assembly 22 includes a fixed outer casing 63 in which the housing 60 and the screen 59 are mounted for rotation about a common axis defined by shaft 64. Thus, the housing 60 and screen 59 rotate in concert. An outlet chute 65 is located adjacent the edge 62 of the housing 60 and communicates with an outlet screw conveyor 66 so that the fully processed particulate material, which has passed through the screen 59 can be moved from the plant and collected. An additional chute 67 is located below fingers 68 and communicates with another screw conveyor 69 which is adapted to return the partially dried and comminuted larger particles, which pass between the fingers 68 back to the flow dryer for reprocessing. In the illustrated embodiment, a further screw conveyor not shown is mounted within a return pipe 70 illustrated as being mounted at right angles to the screw conveyor 69.

In use, the screen assembly is positioned so that the

shaft 64 is located at an oblique to the horizontal and thus, the fingers 68 are located at a lower end of the screen assembly, and particulate material to be screened can enter the upper end of the screen assembly usually via a chute from the cyclonic separator, as the screen rotates the particulate material will travel along the screen and the smaller fully processed particulate material will pass through the screen and travel down over the edge 19 and be conveyed by the screw conveyor 27 to exit the plant. The larger partially dried and partially comminuted particles will continue to travel along the projecting portion of the screen until they encounter the fingers which are spaced so that the larger particles can pass between the fingers and travel down chute 29 onto screw conveyor 30 where they are returned to the flow dryer for further processing. Filamentary materials such as wool or cotton will not pass between the fingers but will tend to accumulate and ball until the balled material reaches such a size that it exits the screen assembly as illustrated by the arrow 32. It will be appreciated from the foregoing that the construction of the screen assembly with a rotating housing spaced from the screen enables the screen capacity to be increased to thereby increase plant throughput beyond that previously achievable. Likewise, the construction of the preheater enables the preheater to be assembled in place at the factory thereby significantly reducing on-site installation. Finally, the whole plant can be transported within a single scaled twenty foot shipping container thereby reducing the likelihood of pilfering or the storage of contraband within the container.

Whilst the above has been given by way of illustrative example of the present invention, many variations and modifications thereto will be apparent to those skilled in the art without departing from the broad ambit and scope of the invention as set forth in the appended claims.

CLAIMS

1. A processing plant contained within the periphery of an imaginary box the size of a shipping container, the plant comprising a flow dryer and a pretreatment facility for pretreatment of matter before delivery of pretreated matter to the flow dryer, the flow dryer including an inlet duct, an agitator and a drying duct connected in series, the drying duct and inlet duct being generally upright ducts disposed in side-by-side fashion with the agitator bridging between respective lower end portions of the inlet duct and the drying duct, a burner chamber behind and in flow communication with an upper end portion of the inlet duct, a cyclonic separator behind and in flow communication with an upper end portion of the drying duct, the pretreatment facility comprising a preheater located adjacent and externally of the inlet duct, the preheater having an inlet for flow of gas into the preheater from the inlet duct and an outlet for flow of gas from the preheater back into the inlet duct.

2. A plant as defined in claim 1 wherein the preheater includes an array of spaced series connected pipes along which matter to be preheated can travel prior to the preheated matter being delivered to the agitator, each pipe having a screw conveyor to convey the matter so the matter travels through the preheater along a generally serpentine path, the preheater having an outer housing spaced from the pipes so hot gas introduced to the preheater can circulate about the pipes in heat transfer relation.

3. A plant as defined in claim 2 wherein the flow dryer includes a closure member operable to selectively divert all or a portion of the hot gas flowing along the inlet duct to the preheater.

4. A plant as defined in claim 3 wherein the inlet and outlet are defined by openings in the preheater housing on opposite sides of an inlet duct partition in the inlet duct.

5. A plant as defined in claim 4 wherein the closure

member comprises a movable flap or plate located adjacent an upstream end of the inlet duct partition to selectively intercept the stream of hot gas and thereby divert selected proportions of the hot gas stream either side of the partition.

6. A plant as defined in claim 4 wherein the partition is a plate extending partially along the inlet duct adjacent the preheater inlet and the preheater outlet, the partition having respective pivotal plates coupled to respective upstream and downstream ends of the partition, the respective plates being pivotable to engage respective opposed walls of the inlet duct to allow or prevent passage of hot gas along the inlet duct on respective opposite sides of the partition the said closure member comprising the upstream one of said pivotal plates.

7. A plant as defined in any one of claims 1 to 6 further including a press adapted to receive heated matter from the preheater for extraction of tallow, the press being located below the preheater and including an elongate housing, a tubular screen within the housing, the tubular screen having inlet and outlet ends with an outlet adjacent the outlet end, a screw conveyor inside the tubular screen to convey matter from the inlet end to the outlet end and force the matter through the outlet, a choke adjacent the outlet of the tubular screen, the choke comprising a biased closure member, the biased closure member being biased toward the outlet to inhibit passage of matter through the outlet and thereby press the matter so tallow is extracted through the screen.

8. A plant as defined in claim 7 wherein the screw conveyor is driven by a drive motor located beneath the housing so that the press and the motor form a compact structure.

9. A plant as defined in claim 7 further including an apertured reinforcing plate on which the tubular screen is supported.

10. A plant as defined in any one of claims 1 to 5 further

including a rotary screen assembly located below the burner chamber and the cyclonic separator and comprising a rotary screen having an endless mesh wall through which particulate matter can be screened as the screen rotates about a longitudinally extending axis, and a housing having an endless imperforate wall surrounding the screen to receive particulate material that has passed through the screen, the housing being rotatable about a longitudinally extending axis, in use the mesh wall of the screen and the imperforate wall of the housing being set at an oblique to the horizontal so that as the screen and the housing rotate about their respective longitudinal axes particulate material can travel along the respective walls to a lower end of the screen assembly.

11. A plant as defined in claim 10 wherein the rotary screen is a generally cylindrical screen including a lower edge comprising a plurality of longitudinally extending and circumferentially spaced fingers protruding from the housing and secured to the mesh wall so that larger particles that have failed to pass through the mesh wall can pass between the fingers and be returned to the flow dryer for reprocessing while lighter filamentary material such as wool or cotton can ball on the fingers as the screen rotates and finally exit the screen for collection.

12. A plant as defined in claim 10 wherein the housing is cylindrical and is mounted concentrically with the screen, the screen and the housing being rotatable in concert.

13. A plant as defined in claim 11 wherein the screen assembly includes two chutes, an outlet chute adjacent the lower edge of the housing communicating with an outlet conveyor which is adapted to deliver the finished product from the plant for collection, and a recycling chute communicating with a recycling conveyor which is adapted to return the larger partially dried and comminuted particles to the flow dryer for reprocessing.

14. A method for construction of a processing plant so the plant is contained within the periphery of an imaginary box

having the dimensions of a shipping container, characterised in that the method includes the steps of:-

(a) forming a first layer of construction, the first layer including a first side frame member;

(b) forming a second layer of construction upon the first layer, the second layer of construction comprising, an agitator, an inlet duct connected to an inlet of the agitator and a drying duct connected to an outlet of the agitator with the agitator bridging between respective opposed end portions of the inlet duct and the drying duct;

(c) forming a third layer of construction upon the second layer of construction subsequent to or prior to forming part of a fourth layer of construction, the third layer of construction including a preheater mounted in gas flow relationship with the inlet duct and a press adapted to receive preheated matter from the preheater, the preheater comprising an array of spaced series connected pipes along which organic matter to be preheated can travel, each pipe having a screw conveyor to convey the organic matter so that matter travels through the preheater along a generally serpentine path, an outer casing spaced from the pipes so hot gas introduced to the preheater can circulate about the pipes in heat transfer relation;

(d) forming a fourth layer of construction prior to or subsequent to forming the third layer of construction, the fourth layer of construction being spaced from the second layer of construction, the fourth layer of construction including a burner chamber adjacent to and in communication with the inlet duct and a cyclone adjacent to and in communication with the drying duct, and a screen assembly adapted to receive product from the cyclone;

(e) forming a fifth layer of construction on the fourth layer of construction, the fifth layer of construction including a second side frame member opposed to the first side frame member.

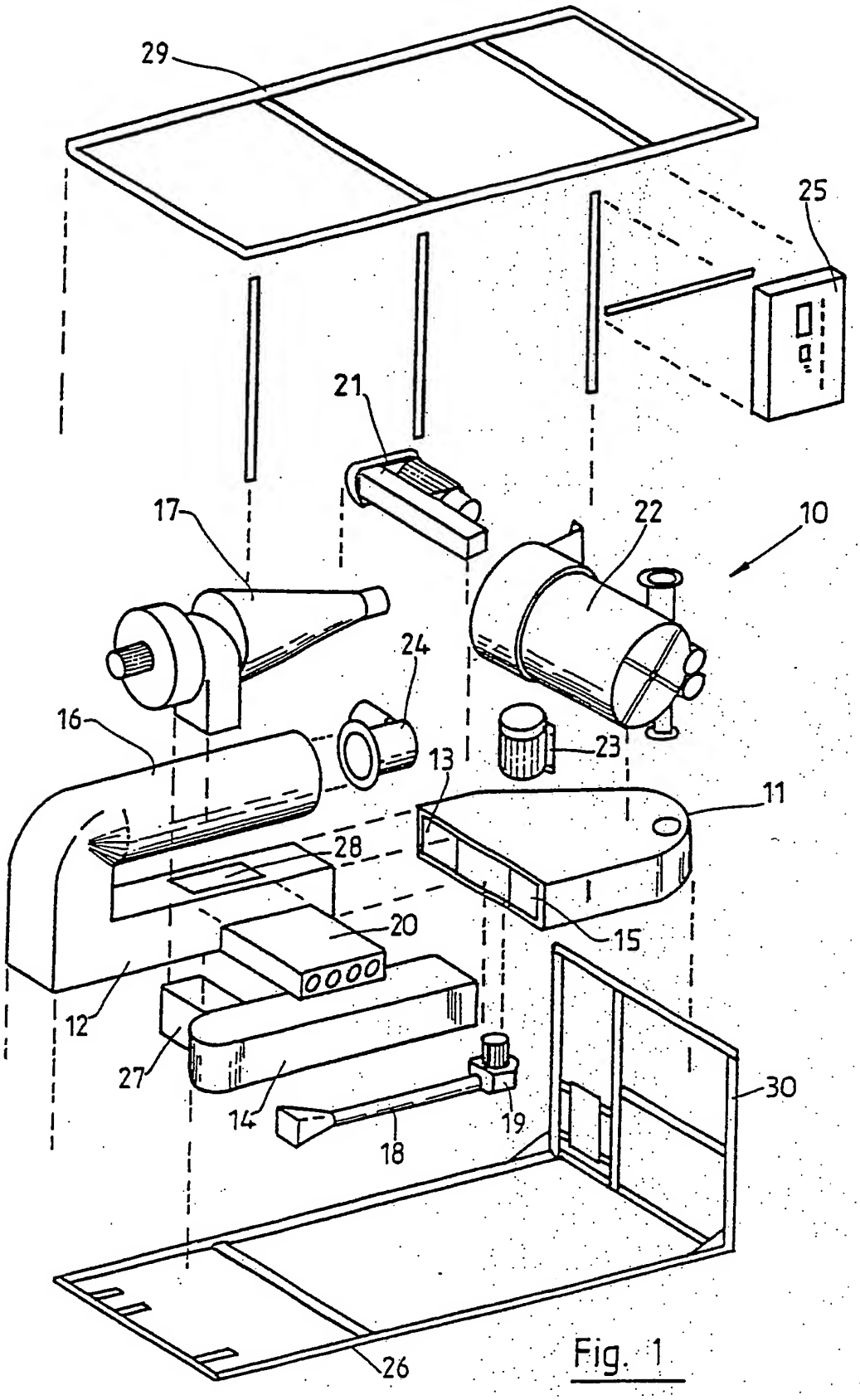

Fig. 1

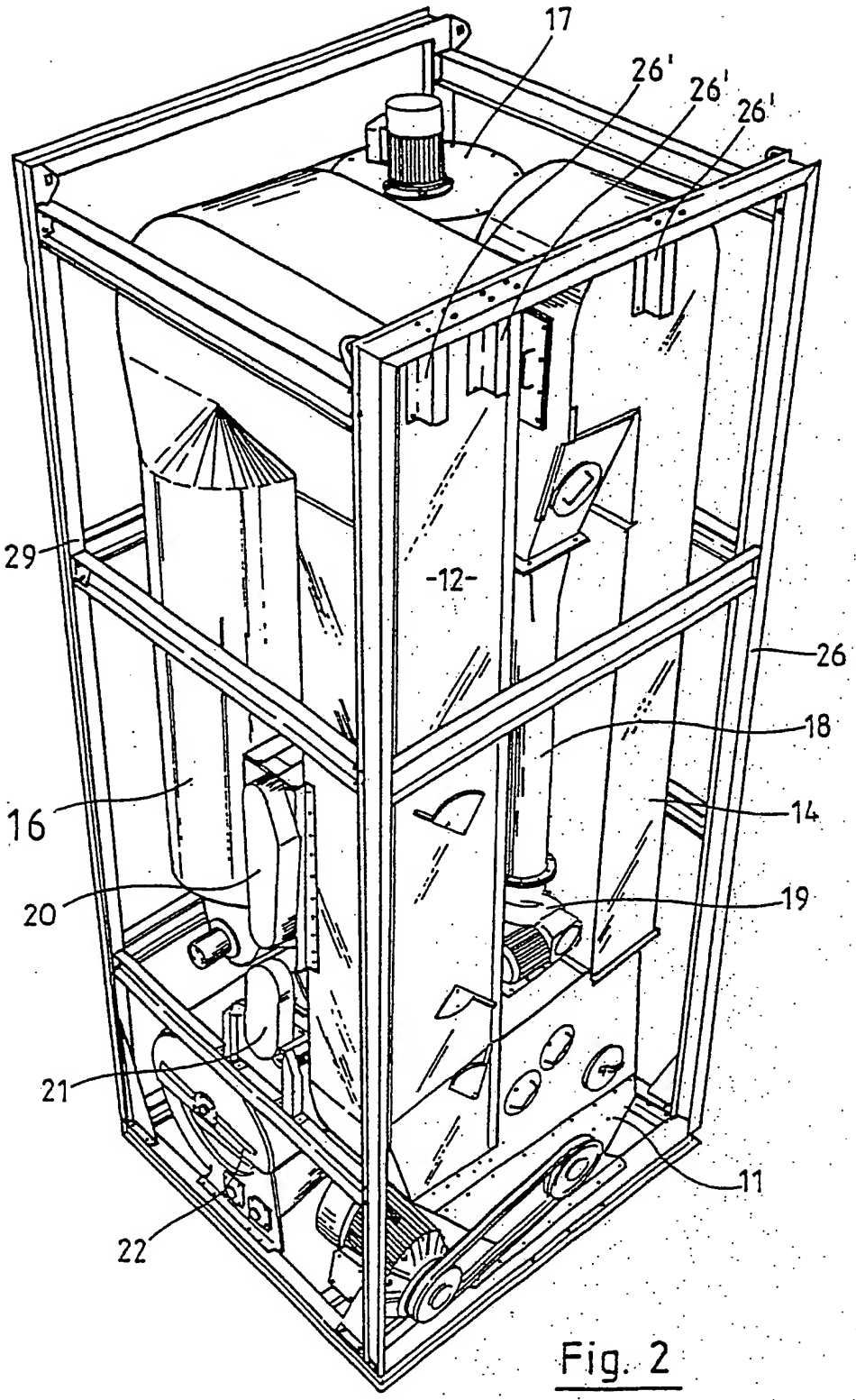

Fig. 2

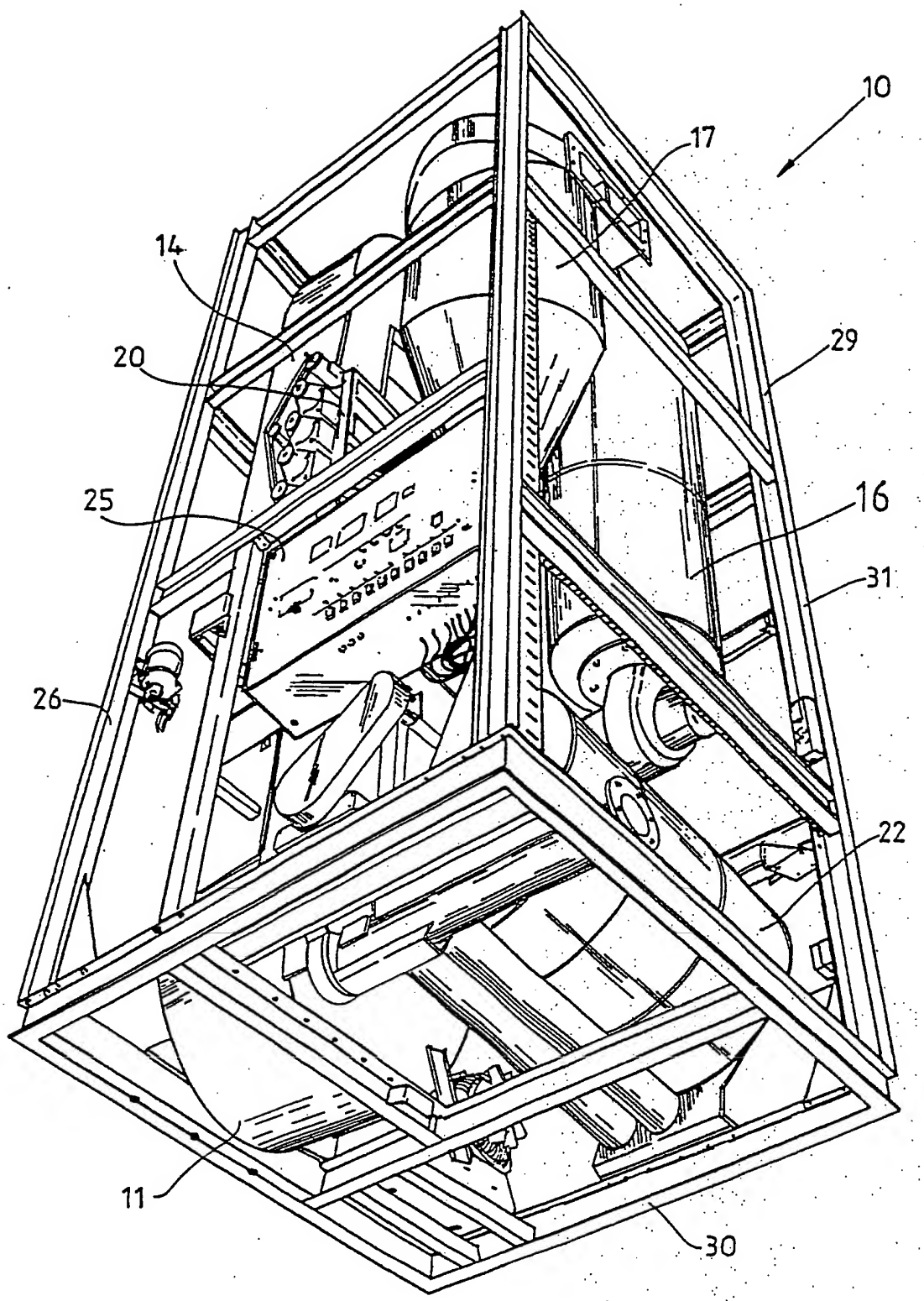

Fig. 3

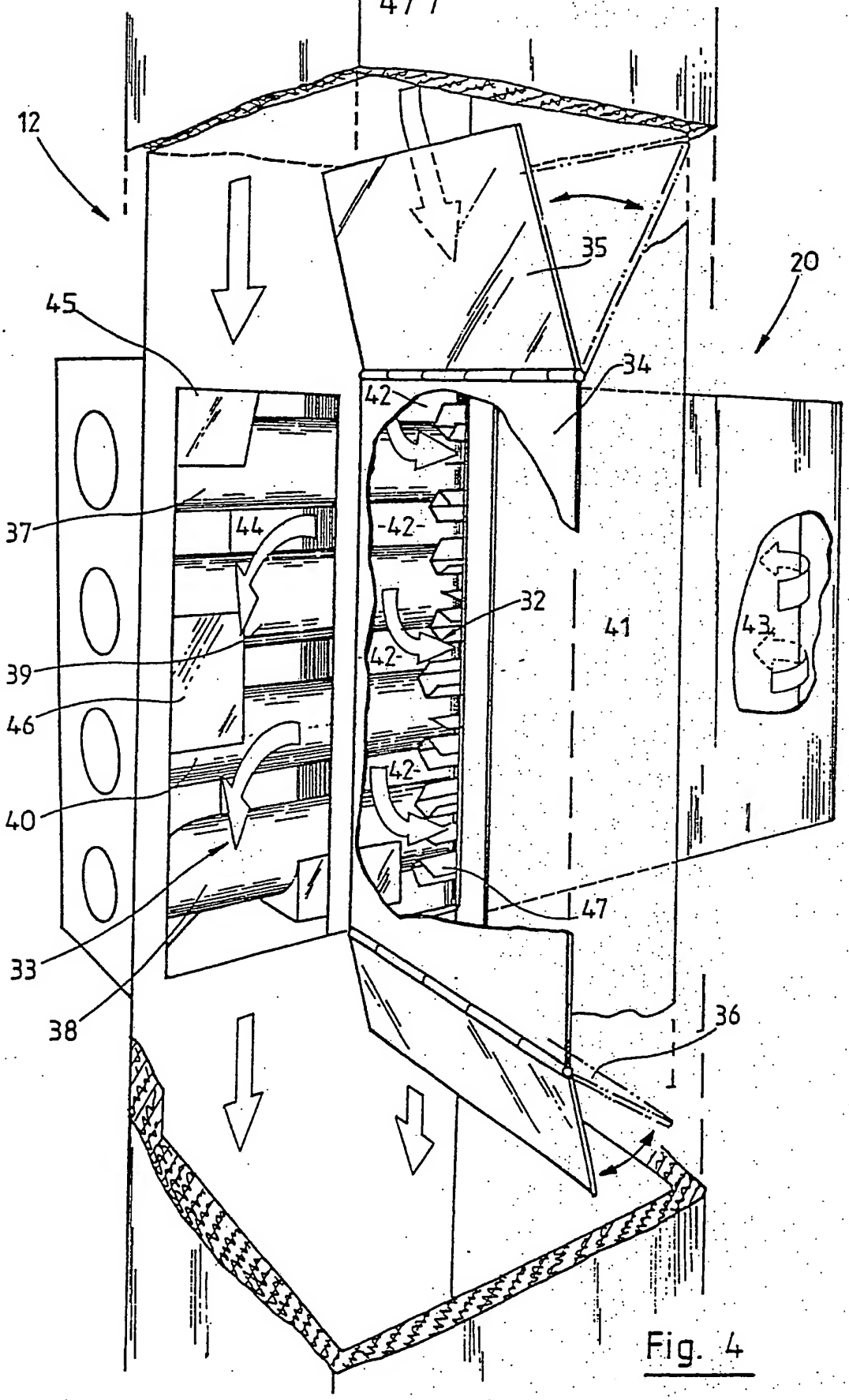

Fig. 4

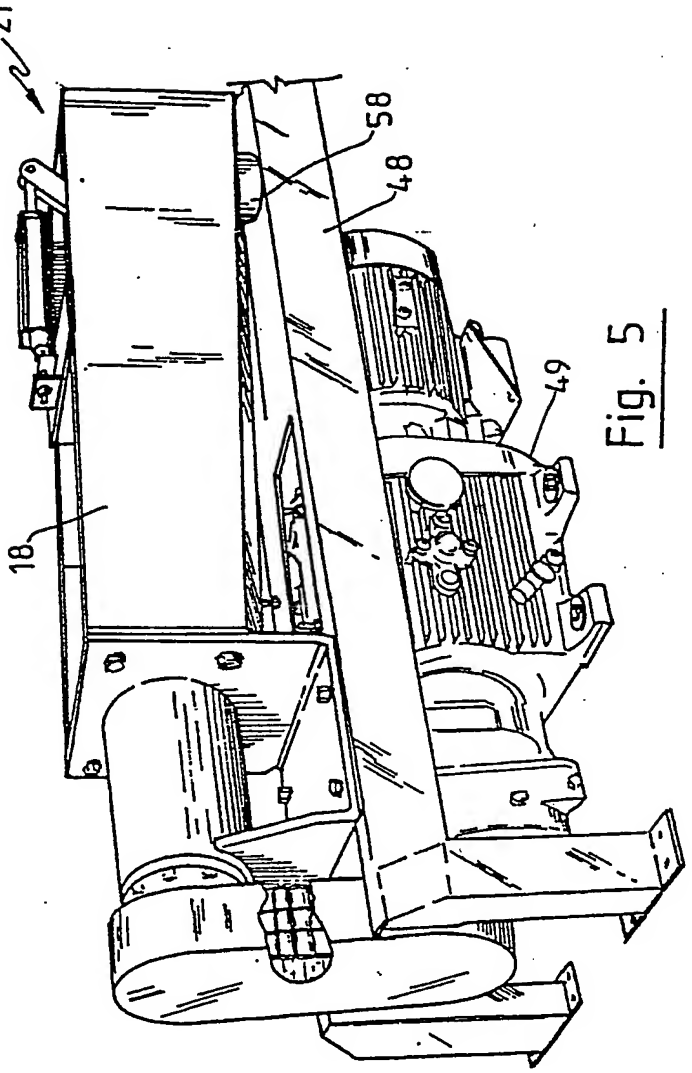

Fig. 5

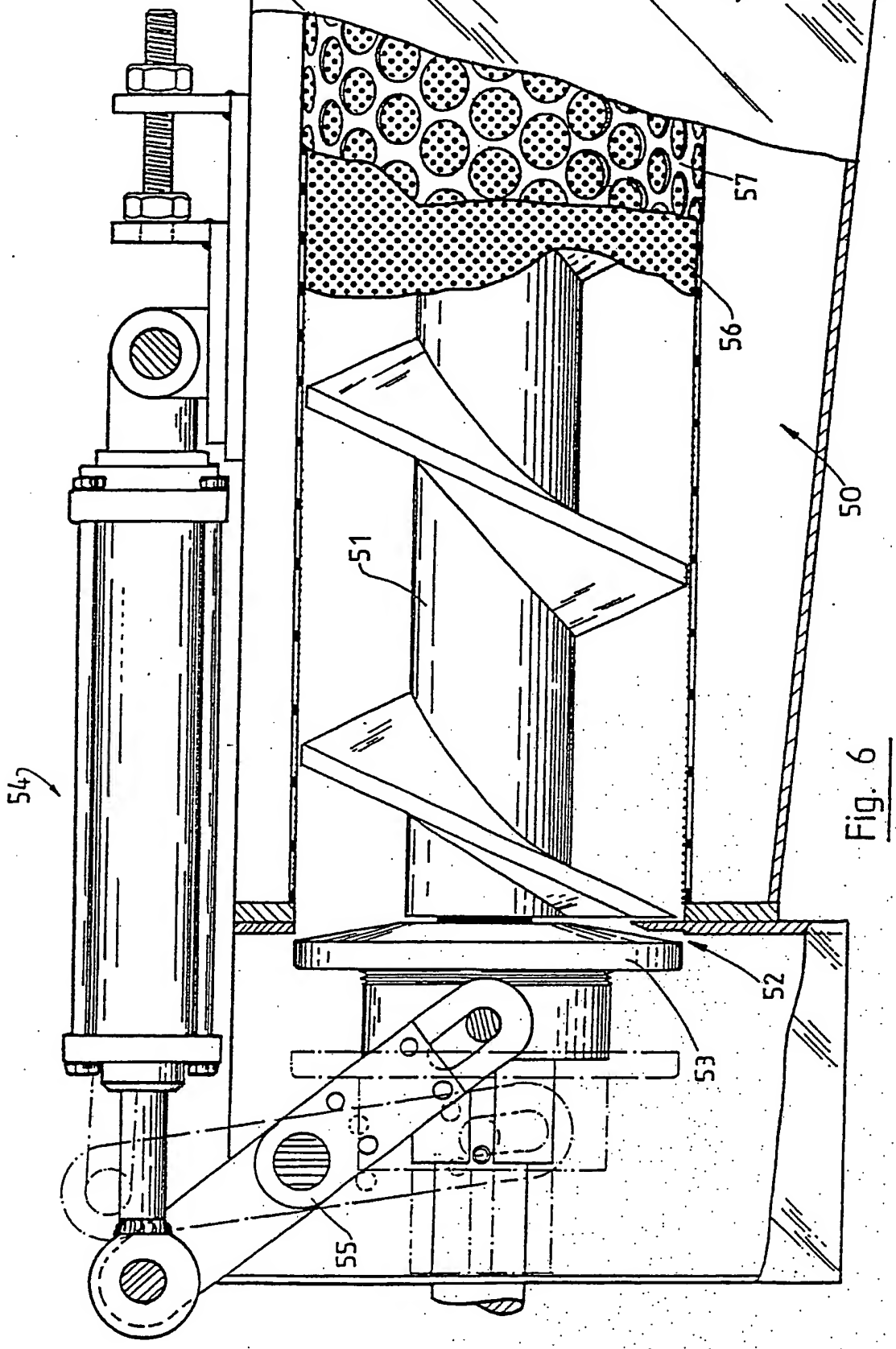

Fig. 6

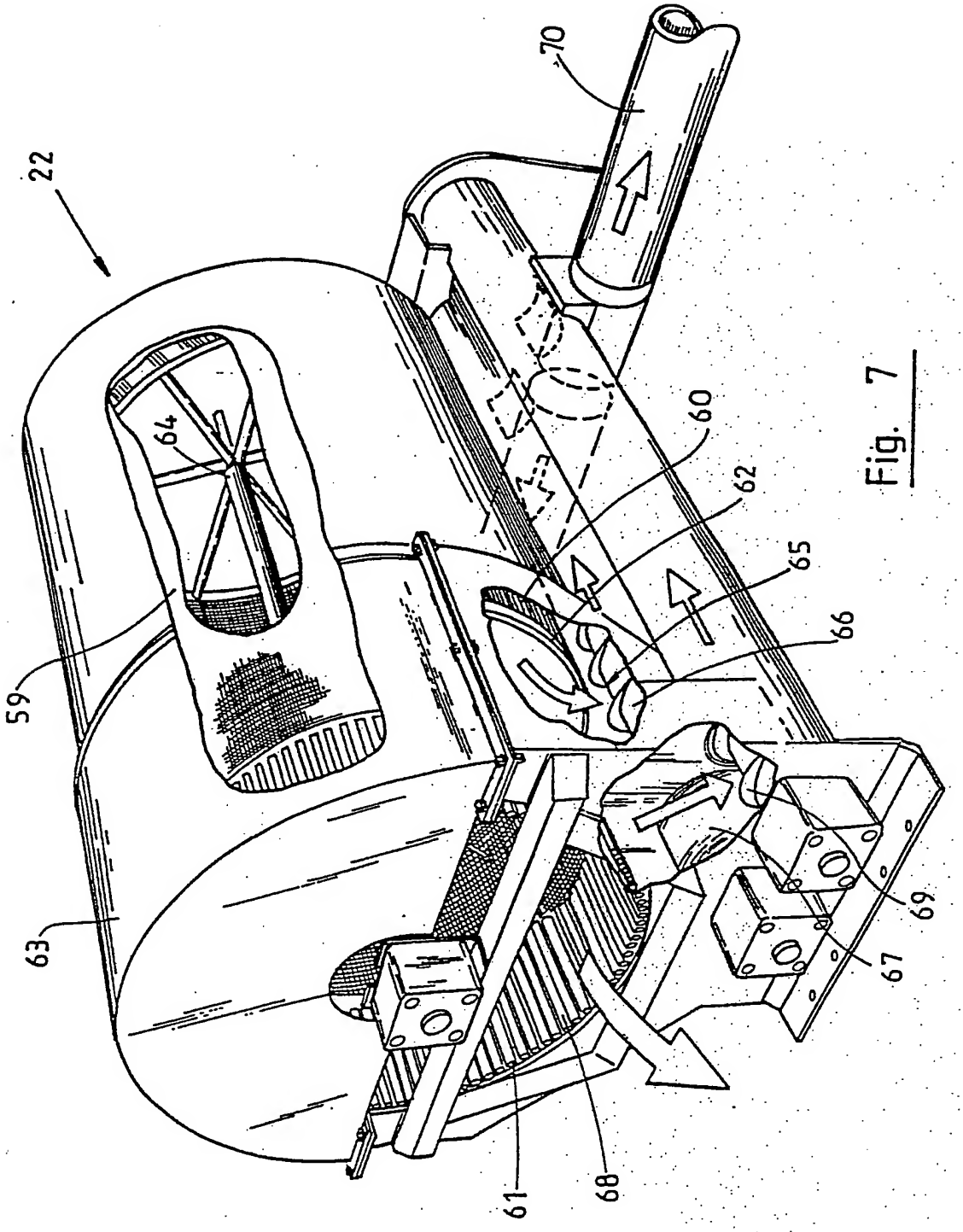

Fig. 7

INTERNATIONAL SEARCH REPORT

International Application No. PCT/AU 90/00515

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) 6

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[5] F26B 3/10, 15/20, 17/10, A23B 4/03

II. FIELDS SEARCHED

Minimum Documentation Searched 7

Classification System	Classification Symbols
IPC	F26B 3/10, 15/20

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 8

AU : IPC as above, F26B 17/10, A23B 4/03, 4/04

III. DOCUMENTS CONSIDERED TO BE RELEVANT 9

Category*	Citation of Document, 11 with indication, where appropriate, of the relevant passages 12	Relevant to Claim No 13
A	GB,A, 238782 (HARDCASTLE) 27 August 1925 (27.08.25) See Figs, claim 1.	(1)
A	US,A, 2497367 (NOTEVARP) 14 February 1950 (14.02.50) See claim 1, column 2 lines 3-17.	(1)
A	US,A, 3263592 (HICKEY et al) 2 August 1966 (02.08.66) See Fig 1, column 1 line 68 - column 3 line 43, claim 1.	(1)
A	FR,A, 1560045 (C. VAN DER LELY N.V.) 14 March 1969 (14.03.69) See Fig 1, Resume.	(1)
A	DE,A, 2250193 (MAYER) 25 April 1974 (25.04.74) See Fig 1, page 11 line 8 - page 15 line 8, claim 1. (continued)	(1)

* Special categories of cited documents: 10

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1 February 1991 (01.02.91)	6 February 1991
International Searching Authority	Signature of Authorized Officer
Australian Patent Office	G.J. BROXAM

Form PCT/ISA/210 (second sheet) (January 1985)

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

A	US,A, 3707774 (EISE et al) 2 January 1973 (02.01.73) See Diagram, claim 1.	(1)
A	US,A, 4573278 (RUIZ-AVILA) 4 March 1986 (04.03.86) See Fig 1, claim 1.	(1)
A	AU,B, 48283/85 (591071) (AKT CONSULTANTS PTY LTD) 10 April 1986 (10.04.86) See Fig 1, claim 1.	(1)

V. [ ] OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE 1

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.[ ] Claim numbers ..., because they relate to subject matter not required to be searched by this Authority, namely:

2.[ ] Claim numbers , because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3.[ ] Claim numbers ..., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4 (a):

VI. [ ] OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING 2

This International Searching Authority found multiple inventions in this international application as follows:

1.[ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2.[ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3.[ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. [ ] As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

[ ] The additional search fees were accompanied by applicant's protest.

[ ] No protest accompanied the payment of additional search fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 90/00515

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Members		
FR 1560045	DE 1778361	NL 6705920	
US 3707774	BE 763655	CA 930542	CH 520633
	DE 2108426	ES 388712	FR 2083952
	NL 7102569		
US 4573278	AU 11062/83	BR 8305201	DK 4126/83
	GB 2124350	IN 159480	NO 833309
	NZ 202985	WO 8302495	

END OF ANNEX